

Atlantic coast. On the morning of the 20th the barometric fall extending northward, became more sudden and marked; New London barometer 0.34 below the normal (a fall of 0.39 in eight hours) Cape Hatteras barometer 0.31 below the normal (a decrease of 0.20 in eight hours.) The lowest pressure connected with area No. X was then 0.30 below the normal at Parry Sound. At midnight this area was central over the Bay of Fundy, with the following decrease of pressure reported for the past eight hours: Sydney, 0.38 inch; Father Point, 0.39; Chatham, 0.50; Halifax, 0.59; Eastport, 0.61 and Yarmouth, 0.71. On the morning of the 21st the area united with No. X over the Gulf of St. Lawrence: Sydney barometer 29.29 or 0.61 below the normal (a fall of 0.71 in eight hours and 1.09 in sixteen hours.) Cautionary Signals were displayed during the 20th for New England and the North Carolina coast, and were lowered, in the latter district, at midnight. Cautionary Off-shore Signals were also ordered for the New Jersey coast. In New England, except for Eastport, these signals were later changed to off-shore. These signals were lowered on the New Jersey coast on the morning of the 21st, but were continued at the remaining stations until the morning of the 22nd. This storm was one of unusual violence off the New England coast, the Canadian Maritime Provinces and off the Banks of Newfoundland, continuing in the latter district until the 25th. A dispatch from St. John's, N. F., reports that over thirty vessels were lost; fourteen in Bona Vista harbor, six in Conception Bay, several in Green Bay. The following are some of the wind velocities reported: Portland, W. 31; Shoreham, NW. 42; Boston, W. 44; Wood's Holl, NW. 44; Thatcher's Island NW. 40; Yarmouth, N. 55; Father Point, 21st, a. m., W. 48, p. m., W. 84, m., W. 65; 22nd, a. m., W. 54, p. m., W. 60, m., W. 48.

No. XII.—During the 22nd and 23rd, the pressure fell gradually over Nevada; on the morning of the 24th, Pioche barometer 0.31 below the normal. Apparently withdrawing southeastward into New Mexico, the area gradually filled up during the 25th. As a portion of this area extended into Texas, Cautionary Signals were ordered for that coast on the 24th, but were not justified.

No. XIII.—formed between high areas Nos. VII and VIII. Central at midnight of the 23rd over Lake Superior it moved nearly due east, and passing through Maine, was central over the Gulf of St. Lawrence on the afternoon of the 25th. A marked feature of this area consists in the fact that the lowest pressures during its passage were 0.19 *above* the normal at Marquette on the morning of the 24th, and 0.13 *above* at Halifax the afternoon of the 25th. Cautionary Signals were displayed on Lakes Michigan, Huron and Erie during the 24th, but were justified only on Lake Huron; Alpena, S. 25; on that lake the storm was very severe, and the Steamer *Sincoe* foundered, twelve men lost.

No. XIV.—During the 26th the pressure decreased slowly over the Plateau region; Pioche barometer, the morning of the 27th, 0.33 below the normal. Extending slowly eastward with slightly increased pressure, the area, on the morning of the 28th, in the shape of a trough, covered New Mexico, western Texas and northern Arizona, with the lowest pressure at Fort Stockton, 0.25 below the normal. Subsequently the area gradually filled up.

No. XV.—This area apparently developing in Manitoba where it was central at midnight of the 27th, following an easterly path passed down the valley of the St. Lawrence during the 29th. While passing eastward its centre skirted the northern limits but at no time entered the confines of the United States. Signals were displayed, somewhat late, at Grand Haven.

No. XVI.—This area probably developing in Saskatchewan, was in northern Montana on the morning of the 30th. It moved slowly eastward and was central, at midnight, in northeastern Dakota; St. Vincent and Fort Stevenson barometers 0.69 below the normal.

INTERNATIONAL METEOROLOGY.

Three International charts, Nos. IV, V and VI, accompany the present Review. They are for the months of *October*, 1880 and *March*, 1879.

Chart No. IV.—This is a *preliminary* chart, and indicates, as well as is at present (Dec. 10, 1880,) possible, the tracks of some of the principal storms over the North Atlantic Ocean and adjacent land areas during the month of *October*, 1880. The meteorological conditions over the North Atlantic Ocean during this month were characterized by very severe storms, all those indicated on the chart having been accompanied by hurricane winds. The general position of the tracks is much more to the south than usual, and noteworthy peculiarities are found in the small number traversing the region of Newfoundland, (reports from St. John's and Heart's Content not yet to hand,) and in the narrow limits within which an unusually large number of storms arrived on the western coast of Europe, not less than five severe storms arriving at the entrance of the English Channel during the month, namely, on the 5th, 7th, 20th, 22d and 27th. In conformity with this distribution of the storm-centres, the weather over the British Isles was marked by cold northeasterly winds and heavy rains, the latter resulting in disastrous floods and the former reducing the average temperature several degrees below the normal value. Thus, for the week ending October 25th, the temperature deficit in the several districts, (see *Weekly Weather Report*, issued by the Meteorological Office, London,) ranged from 8° to 11° Fahr. For the same reason easterly winds prevailed, almost without intermission, over the ocean north of the 45th parallel throughout the entire month. As yet no storm-centre for this month

can be traced entirely across the Atlantic, although the areas Nos. VII and VIII were in all probability the same low area. Areas Nos. I, III and VI, and probably IX and XI, were tropical hurricanes. No. I passed north, to the eastward of the Bermudas, during the 2nd. Below are given in condensed form, reports from about 25 vessels, of observations, made during the 1st, 2nd, 3rd and 4th, and arranged according to latitude:

October 1st.			October 2nd.			October 3rd.			October 4th.		
N.	W.	Hurricane from—	N.	W.	Hurricane from—	N.	W.	Hurricane from—	N.	W.	Hurricane from—
25	63	—	27	64	ENE.—E.—calm—SW.; centre at 1:30 a. m.; barometer 27.40.	34	57	—	37	55	SSE.—NE., 5 hours.
26	64	E. to NW., 12 hours.	27	66	NNE.—SW., several hours.	35	50	SE.—NE.	38	54	ESE.—ENE.
27	63	SW.	28	68	SW. and W.; centre at 8 a. m.; barometer 27.40.	35	56	SE.—NW., 12 hours.			
27	63	—, 2 hours.				35	57	NE.			
27	64	ENE. to E.	29	63	—	35	59	—, 10 hours.			
28	64	—	30	64	SSE.—NE., 14 hours.	36	55	E.—N., 5 hours.			
			32	64	SE.—WNW., 4 hours.	37	56	SE. to WNW., 3 hours.			
			32	64	NE.—SE., 7 hours.	37	56	NNE.			
						37	58	SE. to NW.			
						38	54	SE. to NE. and NNW.			

This storm appears to have died out on the 4th over mid-ocean. No. II is a continuation of area No. XIV. (chart IV, October REVIEW). From the 1st of October to the 5th, it moved slowly eastward from the Azores to the mouth of the English channel as a severe storm, and thence, during the 5th and 6th, with decreased energy, to the Baltic, where it appears to have dissipated. Over the Atlantic, the centre of this storm was closely followed by the *S. S. Nederland*, as shown by the following observations:

Date.	N.	W.	Barometer.	Wind (0—12.).
3rd.....	47	29	29.35	NE. 6, rain.
4th.....	48	26	29.67	NE. by E. 10, stormy.
5th.....	48	22	29.82	NE. by N. 10, stormy.
6th.....	49	18	29.76	NNE. 8, squally.
7th.....	49	13	29.56	NNE. 10, storm.

The fall of the barometer, during the 6th and 7th, was due to the formation of a secondary depression off the mouth of the channel on those days and which appears to have remained almost stationary over this region as a severe storm until the 10th, when it dissipated near Cherbourg. The track of this latter storm is not charted. No. III is a continuation of the low barometer area No. IV, already described in the October *Review*. In the absence of more definite data, the following remarks by Mr. Chas. Hasselbrink, of Havana, Cuba, may be of interest in regard to the early history of this storm. On the 2nd of October he reported:—"Since September 28th, we have been feeling the effects of a storm; although the symptoms have not precisely the typical characters of a cyclone, yet the wind blew fresh from NW. on September 28th and 29th, then from NE. and now from E"; and on the 9th of October, "after the 2nd, we had a few dull, calm days, when the storm (cyclone) was probably most distant from us, but on the 5th, the barometer commenced to fall, probably by the cyclone recurring at that time, and having, on the 6th, entered the second branch of its parabolic course, and coming nearer to us, we, on that day, felt more under its influence," "7th, signs of cyclone perhaps more accentuated." On the 8th, the centre passed over northern Florida, and during the 9th, 10th and 11th thence eastward and to the south of the Bermudas as a severe hurricane. The following mark its journey eastward:

October 8th.			October 9th.			October 10th.			October 11th.		
N.	W.	Wind.	N.	W.	Wind.	N.	W.	Wind.	N.	W.	Wind.
30	80	SE. gale.	33	76	SE. to N. hurricane; cyclone 9 hours.	34	67	E. hurricane.	29	69	NE. gale, 24 hours.
29	79	SSE. hurricane.							33	66	NE., furious gale.
33	75	ENE. hurricane.	36	74	E. gale.				26	66	SW. to N. gale.
32	74	E. gale.							33	63	Hurricane from 10 a. m. to 12th.
									32	52	ESE. gale—Calm—N. hurricane.

The *Bermuda Gazette*, October 12th, states: "October 10th, Sunday, a cyclone evidently passed southwest of us, giving us, however, only a deluge of rain, nearly 2½ inches, (at Gibb's Hill Light station, at southern extremity of Islands, 5.74 inches were measured from the 9th to the 11th, with thick squally weather and on the 11th, NE. fresh gales) and a heavy sea swell," and "on Monday another cyclone passed east of Bermuda." The latter was, however, probably the same storm passing to the eastward, the lowest barometer reading at Gibb's Hill Light occurring on the morning of the 11th—29.70; weather very unsettled and wind NE. No. IV. appeared over mid-ocean on the 9th; on the 10th it developed hurricane strength between 40° and 50° N. and in about 40° W., and appears to have moved in a northerly path. On the 9th bark *Sir G. F. Seymour*, in 38° N. 37° W., had heavy gale from SSE. hauling to WNW. and moderating. Hurricane winds were experienced on the 9th and

10th in 36° N., 39° W., by steamer *Ferdinand von der Taelsen*; on the 10th in 45° N., 37° W., by steamer *Cyanus*; in 46° N., 34° W., by steamer *Inchmaree* and in 47° N., 41° W., by barque *Margaret*, the latter vessel reporting barometer 29.20. On the 11th steamship *Oder*, in 47° N., 44° W., had severe gale and heavy seas from NE. and N. and adds, "hurricane centre passing south of us." Very low pressures continued over a small area in mid-ocean until the 13th, on which day S. S. *Indiana* reported barometer 29.26 in 48° N., 30° W. No. VI appears to have sprung up in rear of No. III on the 11th or 12th. On the latter date comparatively low pressures were experienced over a large area including the Bahamas, (Grand Turk 29.70,) the West Indies (Navassa, 29.91 and St. Thomas 29.82) and the Bermudas (Gibb's Hill Light, about 29.77.) At St. Thomas heavy rain fell from 2 to 3 p. m. Bark *America* reports on the 12th, in 27° N., 66° W., revolving gale from W. at 9 a. m., wind SE., barometer 29.10; 13th, 3 p. m., 29° N., 67° W., wind shifted to NNE., blowing heavily, barometer 29.05 and at 6 p. m. 29.20. Bark *Pepita* reports: 12th, 26° N., 66° W., W'ly gale set in, barometer falling slowly to 29.10; 13th, noon, 28° N., 67° W., wind hauled to southward with increasing gale; 4 p. m., barometer 28.65; 5 p. m., NE., steady gale, "bark enveloped in thunder and lightning;" 6 p. m., hurricane, vessel hove to under bare poles and thrown on beamends; 8 p. m., wind shifted back to E'd; 9 p. m., barometer rising; 10 p. m., heavy seas sweeping deck; midnight, gale moderating, but heavy seas breaking in all directions. Capt. Robt. Yaxley, of the steamer *Nasmyth* forwards a very valuable record of this storm, from which the following items are taken:—12th, 25° N., 59° W., barometer 30.20, "the sky all round having a dull, green appearance;" 13th, noon, 27° N., 62° W., rain squalls, "the clouds having great way on them from the SSW., with low, rugged clouds near the horizon," barometer gradually falling from 30.00 at noon to 29.00 at midnight; 14th, 3.30 a. m., wind-shifted to SE. in a very heavy squall, lasting about 20 minutes and then backed to SSW. again; 4 a. m., lowest barometer, 28.90; 5.30 a. m., "quite a lull for 20 minutes, the wind then came out from NW. with great strength and a high cross sea," which continued throughout the day, with rising barometer. The *Bermuda Gazette*, Oct. 19th, states "the steady barometer and lull on Wednesday, the 13th, (i. e. after the passage of storm No. III as above) was but the precursor of another storm, for on that night (13th-14th) the wind increased and the barometer fell." At Gibbs' Hill, by noon, 14th, the barometer had fallen to about 29.79, with N. gale and squalls. On the 15th the weather at Bermudas moderated and after quite a stormy period of 7 days duration fine weather generally prevailed at these Islands to the end of the month. No. VII advanced slowly southeastward over the Canadian Maritime Provinces and Newfoundland during the 13th and 14th, and from the 15th to the 18th existed as quite a large area of low barometer over the eastern half of the ocean between the parallels of 30 and 60 N. On the 18th, however, a new centre of depression appears to have formed, somewhat to the south of the preceding, the position of which is shown upon the chart as No. VIII. On the 15th, hurricane winds, from SSE. veering by E. to NW. and lasting 16 hours, were experienced by schooner *Annie J. Marshall*, in 45° N., 50° W. The following low barometer-readings are reported by steamship *Hibernian*, 15th, 48° N., 50° W., 29.11, SSE. 5; 16th, 49° N., 45° W., 29.05, SE. by E. 4. No. VIII moved slowly eastward as a large area of low pressure over the region of the Azores from the 18th to 21st, and arrived upon the coast of Europe on the latter day and the 22nd, as a very severe storm. On the 23rd it appears to have passed rapidly towards the south-east of Europe. During its passage over the eastern half of the Atlantic it was accompanied in its northern quadrants by very severe easterly gales, which were experienced by steamers *Celtic* in 48° N., 31° W., *Nederland* in 48° N., 27° W., and by the *Hermann* in 50° N., 4° W. It was preceded on the European coast by a very severe storm, which appears to have sprung up during the night of the 19th, off the mouth of the English Channel, and which passed rapidly eastward to central Europe during the 20th. No. IX moved northward along the American coast as a very severe storm during the 22nd and 23rd, and was described as No. VIII in the October REVIEW. Over the ocean hurricane winds were experienced on the 22nd and 23rd in 39° N., 74° W., in 40° N., 74° W., and in 42° N., 62° W., and severe gales eastward to the western edge of the Banks of Newfoundland. On the 25th low pressures and easterly high winds or gales prevailed over mid-ocean between 40° and 50° N., and during the 26th and 27th, area No. X appears to have moved rapidly eastward to the European coast, the centre of depression arriving over the British Isles on the 28th, and being followed over the ocean by high barometer, the pressure gradually increasing to the end of the month.

Chart No. V.—Upon this chart are shown the mean pressure, mean temperature, mean force and prevailing direction of the wind at 7:35 a. m., Washington mean time, (0:43 p. m., Greenwich mean time,) for *March*, 1879, over the Northern and at certain stations in the Southern Hemisphere. High pressures, (30.20 in. or 767.1 mm.,) prevailed over the interior of Asia, and the greatest part of the North Atlantic ocean, the highest pressures having been between parallels 30° and 40° north and meridians 25° and 40° west. Low pressures (29.80 in. or 756.9 mm.) extended from Baffin's Bay eastward covering Greenland, Iceland and the northern portions of Sweden, Norway and Russia in Europe, the region of the lowest pressure evidently being within the Arctic zone north of Iceland. The following low pressures prevailed in the vicinity of Behring's sea: 29.55 or 750.6 mm. at St. Paul's Island and 29.76 or 755.9 mm. at St. Michael's. The pressures in Hindostan were slightly above 29.80. The highest mean pressures reported were Ponta Delgada, 30.30 in. or 769.6 mm.; Yennisseisk, 30.28 or 769.1; the lowest, St. Paul's

Island, Behring's sea, 29.55 or 750.5; Stykkisholm, 29.60 or 751.8 The highest readings (reduced to sea level,) reported by cooperating observers were 30.77 or 781.5 at Eastport, Maine, on March 1st, Yennisseisk, 30.73 or 780.6 on the 6th; the lowest 28.57 or 725.7 at St. Paul's Island on the 29th; elsewhere the pressure of 31.00 or 787.4 has been noted as occurring at Irkutsk on the 17th. The lowest temperature mean is that of York Factory -14° F. or $25^{\circ}.6$ C. The winds in general may be said to have been *northwesterly*. In North America they were *variable* except *northwesterly* in the United States eastward of the Mississippi valley; over the North Atlantic ocean, north of parallel 40° *northwesterly* except along the European coast where they were *southwesterly*; in Europe *westerly* with a southern tendency northward of parallel 50° and a northern tendency to the southward of it; in Algeria *variable*, in Asia *northwesterly* in Hindostan and *northerly* along the western coast; being elsewhere on that continent *variable*. As compared with the similar chart for the preceding month (February, 1879,) the following changes are noted: A general increase of pressure over Europe, (except southern Spain and Portugal,) the Atlantic ocean, north of parallel 40° and over the extreme eastern portion of North America. This increase was most marked over the British Isles, France and Germany; the greatest change noted Greenwich $+0.54$. Over Asia a general decrease of pressure occurred, amounting generally to 0.10. In but one instance, (Tashkend, 0.27,) was the decrease greater than 0.17 over that continent. Over the United States the pressure remained nearly stationary, but northward of that country the following *decreases* of pressure are noted: York Factory 0.24; St. Paul's Island 0.30 and St. Michaels 0.49. The greatest increase of temperature occurred over the continent of Asia where it probably averaged 10° F., the greatest change, $+26^{\circ}$ F. having occurred at Yennisseisk. A considerable increase of temperature also occurred in Sweden, Norway and in the interior of North America. But few and isolated stations report a slight and unimportant decrease of temperature.

Chart No. VI.—Upon this chart are traced the paths of 37 of the principal storm areas of the Northern Hemisphere during the month of *March*, 1879. Of these 9 are located along the eastern coast of Asia, and 5 over the Behring's Sea region. Of those along the Asiatic coast, five, Nos. XIV, XVI, XVII, XXXII, and XXXVII, appear to have come from the interior, while four, Nos. IV, XIII, XXIII and XXIX, apparently moved in a northeasterly course at a short distance off the coast and which were probably of tropical origin. For areas, Nos. IV, XVII, XXIII and XXXII, data, showing the progress of translation, similar to that given for areas XXII and XXVI of February, 1879, might be here produced, but for want of space are omitted. Of the storm areas over the North American continent, the unusually large number of 9 can be traced backwards to the Pacific, while of those leaving the eastern coast eight can be traced to the vicinity of Iceland or the European coast. Of those apparently originating over the Atlantic ocean, one, No. VIII, seems to have been of tropical origin, while Nos. II, VII and XXXI appear to have formed within a short distance of the European coast. Of the areas traversing Europe, four came from the Atlantic, and two, Nos. XIV and XIX, formed over the North Sea. The positions given for area No. II are, of course, somewhat doubtful, but the indications of the passage of this area throughout the whole extent from the Madeiras to the interior of Asia, are pretty well marked. The same may be said of the passage of area No. XVI across northern Asia, and of the path, shown in the small sectional chart in the lower right-hand corner, of the Mauritius cyclone of the 20th and 21st of March, 1879.

TEMPERATURE OF THE AIR.

The mean temperature of the air for November, 1880, is indicated by isotherms on chart No. II. The table of temperatures on the right-hand side of that chart shows, (as deduced from Signal Service observations of the past nine years,) the mean temperatures for the various districts, and the departures from such means during November, 1880. As will be observed from that table, the mean in *every district* of the country has been *below the normal*. Such deviations from the normal exceeded 5° over the entire country, except California, the Atlantic and East Gulf States and the Lake Ontario region. The following are the most notable departures at various stations: St. Louis, Indianapolis, Indianola, Corsicana, Brownsville and Denison, from $10^{\circ}.2$ to $11^{\circ}.0$; San Antonio, North Platte, Concho and Laredo, from $11^{\circ}.5$ to $12^{\circ}.1$; Fort Gibson, $12^{\circ}.6$; Cheyenne, 13° ; Rio Grande City and Fort Griffin, Tex., $13^{\circ}.1$; Fort Davis, Tex., and Dodge City, $13^{\circ}.7$, and Denver, $16^{\circ}.3$. Except in the Atlantic States and the Lake Ontario region, (where either November 1873 or 1875 was slightly colder,) the present month has been the coldest since the establishment of the Signal Service stations. From detached stations, not included in districts, the following departures from the mean are noted: Mount Washington, $2^{\circ}.3$ below; Pike's Peak, $11^{\circ}.2$; Key West, $3^{\circ}.6$ below; Punta Rassa, $5^{\circ}.4$ above. In connection with the extremely low temperature of the month, and the deficiency of temperature in northern Florida and at Key West, it is particularly noticeable that the mean temperature at Punta Rassa should be the highest of any year since its establishment in 1871, November, 1873, only excepted.

The following extracts from reports of voluntary observers are noted as of interest:—*Illinois*: Morrison, average temperature lower than for many years; month remarkably cold. Riley, mean temperature $9^{\circ}.3$ below mean of 19 years, and $2^{\circ}.2$ below the coldest November. *Indiana*: Laconia, coldest November on record, or as compared with the past 17 years. St. Meinrad, 22nd, very cold, highest barometer for years. Vevay, coldest November ever observed at this station.